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United States Department of the Interior, J. A. Krug, Secretary
Fish and Wildlife Service, Albert M. Day, Director

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THE TREATMENT OF FISH DISEASES

Illness among fishes may become apparent in many ways. As a general rule, an ailing fish appears listless and is inclined to rest upon the floor of the aquarium or tank, or float at the surface of the water with little or no desire for food. Often an infected fish assumes a grayish cast or a darkening of the normal coloration. Patches of cottony white fungus along the side or back of a fish are certain evidences of disease. If one fish becomes affected, usually all in the tank are in a similar condition and should receive treatment.

Many diseases of fish are caused by small, usually microscopic organisms which are dependent upon the fish for their existence. Some of these microscopic organisms find congenial surrounding only in the body muscles or the internal organs of the fish. These organisms, known as endoparasites, are of little concern from the standpoint of treatment, for there are no methods known at the present time for effectively combatting them, and all hope for the survival of the infected fish lies in a spontaneous natural recovery. The majority of the disease producing organisms live on the external body surfaces or the gills where they may do extensive damage by actually attacking the tissues or by opening up avenues in the skin through which more pathogenic organisms may gain entrance. Such external parasites, or ectoparasites, often may be killed by immersing the infected fish in a disinfecting solution which will prove fatal to the parasite before it does to the fish. However, no method of treatment will kill the parasites without inflicting a certain degree of injury to the fish, hence successful cures can be realized only by applying treatment during the early stages of the disease before the fish is so weakened that it cannot withstand the additional rigors of treatment. Even so, treatments cannot be relied upon to check effectively disease in all instances. Preventing diseases by strict sanitation and intelligent management is far more successful than attempting to cure them by treatment.

METHODS FOR TREATING FISH DISEASES

Precautions

Unfortunately, no hard and fast rules may be drawn for administering treatments to diseased fish. The marked variation in such factors as the condition of the fish, the virulence of the strain of organisms present, and the chemical reaction between the particular water in use and the disinfectant precludes any possibility of evolving a definite formula which will be successful in all instances. Rules for treatment, therefore, must be regarded as merely standards from which one must vary a treatment according to the local conditions.

Whenever possible, treatments should be administered in special containers, preferably glass, and a few fish treated at a time. After treatment, the fish should be kept apart from the healthy ones for a few days in well-aerated water. Fish undergoing treatment should be watched closely and moved to fresh water immediately upon evidence of marked distress. Sudden changes of temperature must be avoided. Solutions should not vary in temperature more than 2°F. as determined by a reliable thermometer. Fish should never be grasped in the hands, as they may be seriously injured. A dipnet made of a soft fabric should be used for transferring the fish from one solution to another, and all handling reduced to an absolute minimum. Small amounts of water should be aerated frequently by withdrawing a dipperful and pouring it back slowly from the heighth of a foot or two.

1. Treatment with strong salt solution. The fish are placed in a 3 percent solution of sodium chloride. Such a strength of solution may be made easily by dissolving five level teaspoonfuls of common table salt in one quart of water. The fish should be kept in this bath, with frequent aeration of the solution, until they show evidence of distress. They should then be removed immediately to fresh water. This treatment may be repeated once or twice at one-day intervals. Strong salt treatment is indicated in infections of white fungus (Saprolegnia) and the external protozoans, Costia, Chilodon, and Cyclochaeta.

2. Treatment with dilute salt solution. This treatment is used only for Ichthyophthirius infections. The fish are placed in a large quantity of salt water for two weeks. The solution should be made by dissolving two level teaspoonfuls of common table salt in one gallon of water. Each day of the treatment, one gallon of the salt water should be siphoned from the bottom of the container and an equal quantity of fresh salt water added.

In the case of most tropical fishes, the salt water bath may be maintained at a constant temperature of 80°F. to hasten the life cycle of the parasite and to increase the resistance of the host. Goldfish should not be kept in warmed water. This method is not applicable to the hatchery fishes, such as bass and trout. These fish should be kept in a trough of rapidly flowing water for two weeks or more, depending upon the water temperature. The lower the temperature, the longer the treatment should be administered.

3. Treatment with acetic acid. The fish should be dipped for one to three minutes in a solution of one part glacial acetic acid in 500 parts water, and immediately placed in fresh water to recuperate. If glacial acetic acid is not obtainable, six teaspoonfuls of vinegar in one pint of water may be substituted with equal success. The acetic acid treatment is used chiefly for Gyrodactylus infections, but is also effective against Protozoa.

4. Treatment with formalin. Probably the most effective treatment for the removal of Gyrodactylus and external protozoan parasites is to place the fish for one hour in a weak solution of formalin. This is prepared by adding 1 part formalin (40% solution of formaldehyde) to 4,000 parts water. The fish are allowed to remain in the solution for one hour and, unless in a weakened condition, are not appreciably injured by the treatment. If many fish are being treated, it will probably be necessary to aerate the water from time to time. This treatment is of no value in combatting bacterial infections.

5. Treatment with potassium permanganate. The fish should be dipped for 20 minutes in one-half grain of potassium permanganate dissolved in one gallon of water. This method was recommended by Dr. Ulric Dahlgren for eradicating the copepod Argulus from goldfish and tropical fishes. Because of the difficulty in weighing such a small amount of this reagent, it is probably advisable to obtain this quantity from a reliable drug store.

6. Treatment with copper sulphate. This treatment is the most toxic of all to fish life. It should never be used except when definitely indicated, and then with utmost caution. In general, the treatment consists of placing the fish for one to two minutes in a one to 2,000 solution of copper sulphate (blue vitriol). It is probably better to obtain one gram of this reagent from a reliable druggist and dissolve it, when needed, in two quarts of water. One should request hydrated copper sulphate and avoid the anhydrous form. Treatment must be given in a wooden or glass container as the copper sulphate will react

chemically with metals. In case definite localized lesions are present on fish, they may be swabbed gently with a one percent solution of copper sulphate, tincture of iodine, or mercurochrome. When swabbing with these powerful disinfectants, avoid any possible contact of the solution with the eyes or gills of the fish. These treatments are indicated for any bacterial infections on the external surfaces of the fish.

The treatment is less injurious to the fish if the copper sulphate is dissolved in a 2-3% solution of common salt (sodium chloride). This is due to the fact that copper sulphate is not directly toxic, but injures the fish by coagulating the mucus on the gills, forming a covering which interferes with respiration. Salt has a tendency to remove the mucus and thus alleviates the effect of the copper sulphate.

7. Disinfection of tanks or aquaria. Tanks and aquaria can be disinfected by washing with a strong solution of fresh chloride of lime or "Zonite." All animals and plants must be removed first. Never use soap or creosote about an aquarium, as they are fatal to fish life. After disinfection, the tank should be washed thoroughly with clean water.

When considerable quantities of a disinfectant are required, it is best to use an improved form of chloride of lime known as "HTH" (high test calcium hypochlorite), which contains a much higher percentage of available chlorine. A solution of 1 oz. "HTH" in 4 gallons of water will disinfect a tank in a few minutes. A fresh solution should be made up just before use, since it deteriorates rapidly on standing.

8. Disinfection of plants. It is extremely difficult to satisfactorily disinfect living plants without injuring them. The following treatment is believed to be about as safe as any that can be recommended.

Dissolve one ounce of powdered alum in one gallon of water and place the plants in this solution for 10 to 20 minutes. The plants should then be washed in running water for five minutes.

For disinfecting tanks without removing the plants (fish should be removed as well as snails and other animal life), use one fourth of an ounce of powered alum to every gallon of water and allow it to stand until a white precipitate forms on the bottom of the tank. The water should then be siphoned off and the tank refilled with fresh water several times to remove completely all traces of the alum.

Unquestionably, there are ailments of fish which are unknown as yet. Still more diseases are known, but no satisfactory method of treatment has been evolved. However, in the case of the commoner diseases, the cause and a reasonably satisfactory cure are known. Although the commoner diseases are well known, very few of them present specific lesions visible to the unaided eye, hence, it is highly advisable to have any ailing fish examined by a competent fish pathologist so that a correct diagnosis may be obtained and the proper treatment administered. If a microscope is available, many parasitic diseases may be diagnosed by the laymen with the assistance of an adequate description of the commoner fish parasites. In any event, indiscriminate treatment of fish is to be avoided. Most diseases which can be controlled will respond favorably only to a specific method of treatment, and the application of any other method is worse than useless. The following table gives the specific treatment for the commoner ailments of fishes:

Disease	Type of fish to be treated	Treatment
Costia Chilodon, Cyclochaeta and other protozoan infections. (Excluding Ichthyophthirius)	All types	Strong salt solution (1) Weak solution of formalin (4)
Ichthyophthirius infections	Tropicals	Weak salt solution at 80°F. (2)
	Goldfish	Weak salt solution (2)
	Trout-salmon	Increased water flow(2)
Gyrodactylus infections	All types	Acetic acid (3) Weak solution of formalin (4)
Copeped infections	All types	Potassium permanganate (5)
Bacterial infections Localized	All types	Swab with disinfectant such as 1% copper sulphate, iodine, mercurochrome
General	All types	Copper sulphate (6)
White fungus (saprolegnia)	All types	Strong sale solution(1) or, swab localized patched with 5% aqueous solution of malachite green.

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